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RUPTURED APPENDICITIS AND RETROCECAL ABSCESS MASQUERADING AS KNEE PAIN IN A PEDIATRIC PATIENT: A CASE REPORT

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☐ **Abstract—Background: Knee pain has a variety of etiologies in the pediatric population, including septic arthritis, osteomyelitis, fracture, ligamentous injury, and neoplasms. Extrinsic sources of knee pain may also be intra-abdominal, although abdominal pathology is much more likely to manifest as hip or proximal thigh musculature pain. Case Report: A 5-year-old healthy male presented with atraumatic right knee pain, discomfort with weightbearing, fever, and elevated inflammatory laboratory markers. Physical examination and magnetic resonance imaging findings of the knee were benign, leading to low clinical suspicion for knee septic arthritis. Blood cultures were positive for a gastrointestinal organism, *Granulicatella adiacens*, suggesting abdominal pathology leading to referred pain. Ultrasound evaluation and computed tomography (CT) of the abdomen revealed a large abscess secondary to perforated appendicitis, which was treated with CT-guided drainage and i.v. antibiotics. The patient's musculoskeletal pain subsided with treatment of the appendicitis. Why Should an Emergency Physician Be Aware of This?: Acute appendicitis may present as knee pain, with other signs and symptoms mimicking septic arthritis, such as fever, inability to bear weight, and elevated inflammatory markers. Considering an array of differential diagnoses in pediatric patients with apparent knee septic arthritis is crucial to prevent delay in diagnosis of alternative infectious sources.**

☐ **Keywords—appendicitis; knee pain; retrocecal abscess; septic arthritis; infection**

INTRODUCTION

Musculoskeletal (MSK) pain is one of the leading causes of disability worldwide, with MSK complaints accounting for 10–18% of all visits to primary care physicians (1,2). The pediatric population is no exception, with MSK pain frequently encountered in both pediatric and adolescent patients. In the pediatric population, lower extremity pain is more common than upper extremity pain, with foot and ankle pain being more commonly seen in children younger than 10 years of age and knee pain more frequently encountered in adolescence (3). The etiology of MSK discomfort is diverse, but can be broadly categorized as either traumatic, defined as an injury resulting from a specific identifiable event, or non-traumatic, when there is no identifiable event (4). Pain severity can also vary widely, from mild "growing pains" to pains signifying a medical emergency. Such emergencies can include life- or limb-threatening conditions, such as infection or a malignancy (5).

Knee pain, specifically, has a variety of etiologies in the pediatric population. Intrinsic sources include septic arthritis, osteomyelitis, fracture, ligamentous injury, and neoplasms (5). Extrinsic sources can also be of MSK origin, commonly reported as referred pain from hip or foot and ankle pathology (6,7). Extrinsic sources of knee pain may also be intra-abdominal, although abdominal pathology is much more likely to manifest as hip or proximal thigh musculature pain. When evaluating

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pediatric knee pain, it is crucial to start with a broad differential diagnosis and obtain a thorough patient history and detailed physical examination.

Knee septic arthritis is an important potential etiology of knee pain in children and is considered an orthopedic surgical emergency. Septic arthritis occurs in 4–10/100,000 children and has the highest incidence in those aged younger than 3 years old (8). Boys are affected more often than girls, and the lower extremity is involved more frequently than the upper extremity, with the hip and knee being most common (9). Typical history includes fever, pain, refusal to bear weight, and erythema, swelling, and warmth of the knee (10). Neonates and infants may present with extremity pseudoparalysis in response to joint pain (11). Children may also be irritable and have a loss of appetite. Laboratory testing usually reveals leukocytosis and elevated inflammatory markers, such as erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP).

The diagnosis of septic arthritis is obtained via joint aspiration with synovial fluid evaluated for total nucleated cell count and microbiology analysis. The Kocher criteria were described in 1999 by Kocher et al. as tools to help distinguish septic arthritis from transient synovitis in the hip (12). It consists of a scoring system based on patient temperature, white blood cell count (WBC), ESR, and ability to bear weight, and has been shown to accurately predict the presence of pediatric hip septic arthritis (13). A similar diagnostic scoring system has yet to be developed for pediatric knee septic arthritis. Ultimately, the decision to perform knee arthrocentesis is based on clinical judgement (10,14).

We describe a case of pediatric acute knee pain and elevated inflammatory markers later diagnosed as ruptured appendicitis with a large retrocecal abscess. This case highlights the overlap of symptoms, signs, and laboratory values for septic arthritis and appendicitis, and the importance of consideration of intra-abdominal pathology as the source of acute knee pain in the pediatric population.

Informed consent to obtain clinical images and report this case was acquired from the patient and parents.

CASE REPORT

A 5-year-old previously healthy male presented to the emergency department with a 2-week history of fever (>38.5°C) and a 1-week history of right knee pain with refusal to bear weight. His symptoms began during a family vacation to Wisconsin; however, there was no history of tick bites or concern for tick exposure. He was not recently subject to sick contacts and had no history of trauma to the right knee. At the time of presentation, he was found to be febrile (37.8°C) with WBC of 20,000/mm^3 and CRP of 11.8 mg/dL. Ebstein-Barr virus (EBV) serology and Lyme disease antibody testing were negative. Blood cultures were obtained at that time. Laboratory results from his primary care provider 2 days prior revealed an ESR of 54 mm/h. Plain radiographs of the right knee revealed a focal area of osteopenia in the distal femur with associated periosteal fluid concerning for early osteomyelitis (Figure 1). The patient was empirically placed on i.v. vancomycin.

In the emergency department, physical examination of the patient's abdomen revealed a soft, nontender, and nondistended abdomen. Bowel sounds were present in all 4 quadrants and no hepatosplenomegaly was appreciated. The orthopedic surgery service was consulted to evaluate for concern of right knee osteomyelitis vs. septic arthritis. At the time of examination, the patient was able to bear weight on the right leg, but was noted to have an antalgic gait. Direct inspection of the knee revealed no erythema, joint effusion, skin lesion, or rash. His knee passive range of motion was 0–100° without an associated increase in pain. His hip passive range of motion was extension to neutral and flexion to 100°. He was noted to have some tenderness to palpation over the distal anterior quadriceps. Sensation was intact to light touch diffusely in the right lower extremity with 2 + posterior tibial and dorsalis pedis pulses. Magnetic resonance imaging of the right hip, femur, and knee was performed, which revealed no evidence of osteomyelitis of the femur or joint effusion of the hip or knee (Figures 2 and 3). He was admitted to the hospital for close observation of his symptoms and empiric i.v. antibiotics.

The patient continued to be febrile (39°C) over the next 24 h and on hospital admission day 2, a blood culture resulted positive for *Granulicatella adiacens*, an organism frequently found in the oral cavity and gastrointestinal tract. At this time, orthopedic surgery's clinical suspicion for septic arthritis or other possible MSK

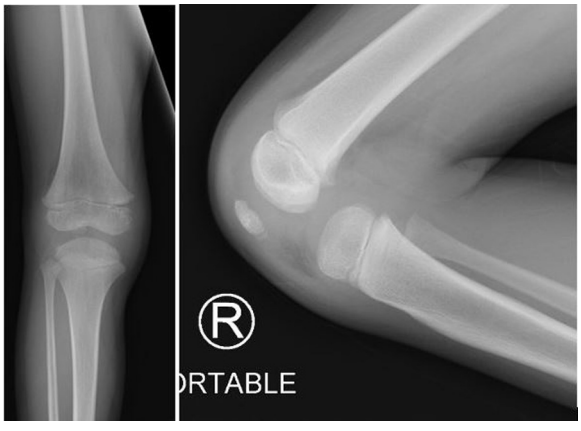

Figure 1. Plain radiographs of the right knee at time of original presentation.

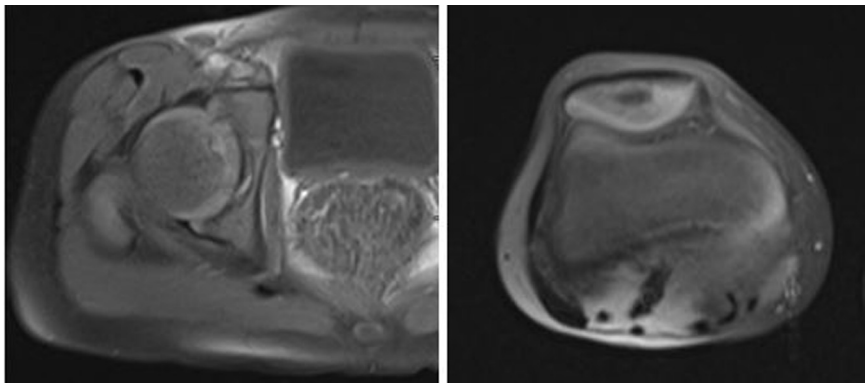

Figure 2. Axial T1 magnetic resonance imaging scan of the right hip and knee.

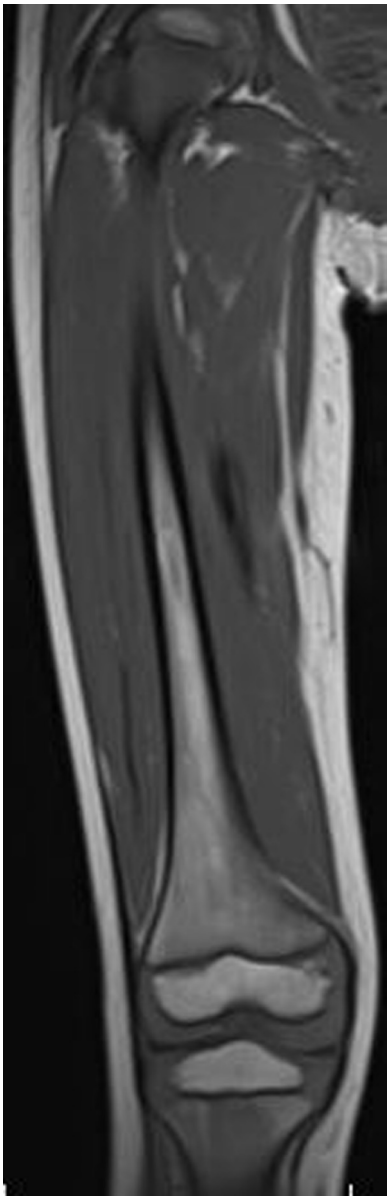

Figure 3. Coronal T1 magnetic resonance imaging scan of the right femur.

sources of infection was low, and it was recommended to evaluate for alternative infectious sources. Although the patient denied abdominal pain and had a benign clinical examination, an abdominal ultrasound was obtained, which revealed a complex mass in the right lower quadrant measuring 6.1 × 5.4 × 5.9 cm, concerning for pelvic abscess (Figure 4). Computed tomography (CT) scan of the abdomen and pelvis with contrast confirmed the presence of an abscess with an appendicolith, compatible with a perforated appendicitis with retrocecal abscess formation (Figure 5). Meropenem was added to his antibiotic regimen of vancomycin at this time.

The patient underwent percutaneous drainage of the abscess by interventional radiology on hospital day 3, and 55 mL of purulent fluid was obtained. Cultures of this fluid grew *Escherichia coli*, *Bacteroides fragilis*, and *Streptococcus anginosus*. On hospital day 7, he had been afebrile for more than 72 h and his cultures had finalized with sensitivities. He was transitioned to oral amoxicillin/clavulanate and metronidazole and discharged to home with his drain in place. His drain output decreased to <5 mL/d and ultrasound confirmed the resolution of the abscess, so his drain was removed 4 days after discharge. Three months after his original presentation, the patient underwent an elective, uncomplicated laparoscopic appendectomy.

DISCUSSION

Appendicitis is a common surgical indication, with more than 250,000 cases reported each year in the United States (15). Like septic arthritis, appendicitis is more common in males than in females (15). It is most prevalent in individuals aged 10–19 years, which is older than the peak incidence for septic arthritis (15). Typical symptoms include nausea, vomiting, fever, anorexia, and periumbilical pain that migrates to the right lower quadrant.

The diagnosis of appendicitis can be difficult, however, as this constellation of symptoms is present in only

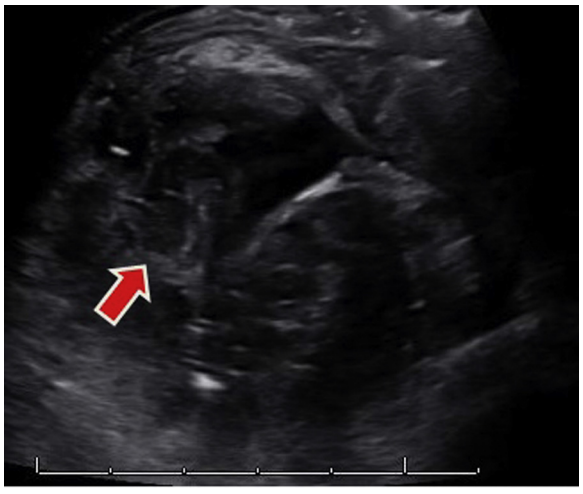

Figure 4. Abdominal ultrasound demonstrating a multiloculated 6.1 × 5.4 × 5.9 cm abscess.

50–60% of patients (16). Children are known to have an even higher variability in presentation than adults (17). Diagnosis is mostly clinical, but can be aided by the use of CT, with sensitivity and specificity of 87–100% and 89–98%, respectively, and ultrasound, with sensitivity and specificity of 85% and 92%, respectively (18). Concern for the utilization of ionizing radiation in pediatric patients and possible decreased accuracy of CT in younger children, however, may prolong the time to diagnosis and treatment (19,20). This delay in diagnosis often leads to an increased risk for complicated appendicitis and associated morbidities, such as perforation, abscess formation, bowel obstruction, peritonitis, and sepsis (21).

This case report demonstrates an atypical presentation of appendicitis leading to an initial workup for septic arthritis. Several factors may have led to this patient's unusual presentation of appendicitis. First, there is an overlap in clinical symptoms and signs, as well as laboratory derangements for appendicitis and septic arthritis. Both have nonspecific symptoms, such as fever and anorexia, and can have accompanying systemic inflammatory response syndrome or sepsis. They also both typically have elevations in WBC, left shift, and elevated ESR and CRP (14,22).

Second, the anatomic location of the appendix can determine the localization of the pain. A retrocecal appendix, like in our patient, may not have significant abdominal pain or show other signs of peritoneal inflammation (23). Appendicitis frequently has pain localizing to the hip, with inability to walk or walking with a limp being reported to be a significant finding in appendicitis in preadolescent children (24–26). Additionally, up to one fourth of preschool-aged patients with appendicitis have a limp or hip stiffness (27). Knee pain, however, is not a commonly reported association (28).

There are a few theories for how intra-abdominal pathology may cause lower extremity pain. One theory is that the close proximity of the appendix to the pelvis and hip allows for extravasation of bacteria and inflammatory markers out of the abdomen, which tracks down anatomic planes of the lower extremity (29). This is supported by frequently reported cases of appendicitis presenting as thigh abscesses, lower extremity swelling, and lower extremity cellulitis, although hematogenous seeding is also possible (30–32). An alternative theory is that the inflamed retrocecal appendix is irritating the posterior abdominal wall, pelvic musculature, or the lumbosacral plexus (28). This is supported by a case report by Koppel and Thompson, in which the saphenous nerve, which supplies sensory innervation to part of the knee joint surface and the medial knee, became entrapped in the subsartorial fascia and caused significant knee pain (7).

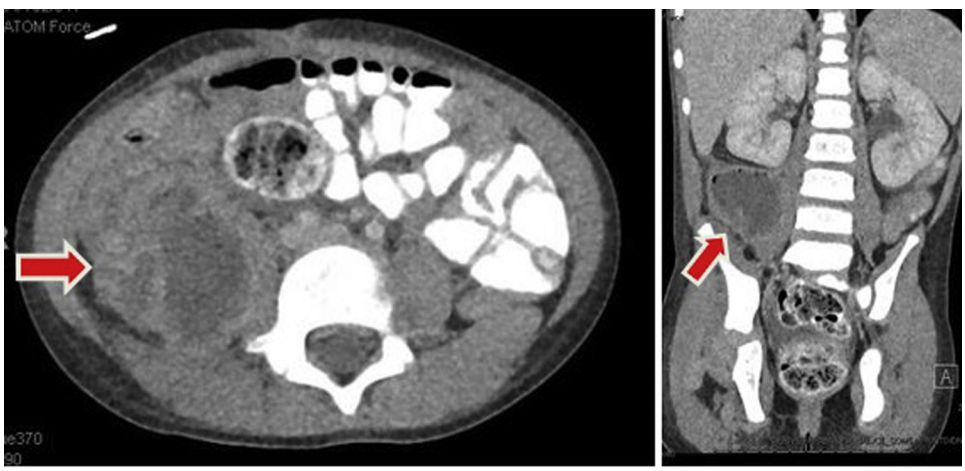

Figure 5. Axial and coronal computed tomography demonstrating the larger right lower quadrant complex abscess.

Regardless of the mechanism, intra-abdominal pathology, especially appendicitis, frequently presents with lower extremity symptoms and signs. Due to the relatively common occurrence of appendicitis, clinicians need to have appendicitis on their differential for hip and knee pain, especially in the pediatric population. Additionally, clinicians must have a high level of suspicion for an occult intra-abdominal source of infection when patients present with fever and elevated WBC and inflammatory markers, with associated negative lower extremity advanced imaging to prevent a delay in diagnosis and associated morbidity.

WHY SHOULD AN EMERGENCY PHYSICIAN BE AWARE OF THIS?

Acute appendicitis may present as knee pain with other signs and symptoms mimicking septic arthritis, such as fever, inability to bear weight, and elevated inflammatory markers. Arthrocentesis of the painful joint can confirm or reject the diagnosis of septic arthritis. Considering an array of differential diagnoses in pediatric patients with culture or Gram-stain–negative apparent knee septic arthritis is crucial to prevent delay in diagnosis of alternative infectious sources.

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